# VERSABUILT
# ROBOTICS

# VBX-160
# OPERATORS MANUAL
# VBXC 3.2

In an effort to provide the best user interface and experience possible, Versabuilt Robotics is contentiously updating and upgrading the VBX-160 software. Although, the functionality will remain the same, please be aware that some of the contents in this manual may differ from the version of software you are currently using.

**DOCUMENT #D10087**
**REVISION B**
**AUGUST 2019**

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## QUICK START GUIDE

### Status/Control Buttons Key

The Control Buttons appear in the upper right corner of the VBX-160 (VBXC). The Control Button display will change based on the current state of the VBXC. The Control Buttons are operable independent of other activities on the screen except when specific dialogs are displayed.

### Status Bar



### Control Buttons

| | | | |
|---|---|---|---|
| Cycle Start | It is used to start or continue running a job. | Part Stop | **Part Stop:** The VBXC will feed hold itself when a part finishes running. |
| Recovery | **Recovery:** This button is available when the system is in the Feed Hold state. The operator uses this button to manually initiate recovery mode. It will cause parts and MultiGrip jaws, held by the robot or in vises, to be canceled. Recovery resets communication with the Robot and CNC and will reset the robot should it become unresponsive. | Op Stop | **Op Stop:** Single Operation enabled. The VBXC will feed hold itself when the current milling operation has finished running. Click again to disable Op Stop. The exact point the Op Stop happens is depending on the Processing Script being used. |
| Feed Hold | **Feed Hold:** This button is visible when the system is running and used to pause a job. When Feed Hold is initiated, the VBXC will stop sending actions to the robot and CNC. The CNC will complete the current action before stopping. | 5psi | **Vise Pressure:** Shows the current pressure for the vises. The vise pressure for each operation can be adjusted in part configuration. When the system is in an idle state, the vise pressure can also be adjusted by double-clicking this icon. |
| Reset | **Reset:** This button appears in Recovery mode. Clicking this button will clear any pending robot motions and resets the robot communication and restarts programming. | 100% | **Robot Speed**: This button displays the current robot speed as a percentage of VBX-160 allowed speeds. Click to change the speed. Max speed is 125% |

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## Status Icon Key

The status icons appear at the top of the screen to the left of the control buttons. Status icons communicate the status of the VBX-160. Green Color indicate matching sensor fired.

| Icon | Description | Icon | Description |
|------|-------------|------|-------------|
| | Gripper or Vise Open | | Gripper or Vise Close |
| | Clamped - Vise 1, 2 or 3 is clamped | | Gripper Float |
| | Gripper Pull Stud Push | | Gripper Pull Stud Pull |
| | CNC Door Open | | CNC Door Closed |
| | Rinse Part | | Air Dry Part |
| | Fumble - The gripper fumbled and mis-picked or dropped a part. | | Cell Door Open / Closed |

## Shelf Slot Color Key

| Color | Description | Color | Description |
|-------|-------------|-------|-------------|
| | **Red - Error**<br>Slot has an error | | **Green - Part Done**<br>Part is complete, on the shelf waiting to be unloaded |
| | **Pink - Milling**<br>The part and Multigrip jaws from the slot is currently milling | | **White - Canceled/Empty**<br>Part is canceled and held by the robot or slot is empty |
| | **Purple - Holding/Waiting/Transferring** | | |

## Stack Light Status Key

The stack light on the roof of the VBX-160 indicates job status as follows:

| | |
|---|---|
| Illuminated Green: Running | Illuminated Red and Flashing: Error has occurred |
| Illuminated Green and Blinking: Running, but in feed hold | Not illuminated: Idle |

## THE VBX CONTROLLER

The VBX Controller (VBXC) is the operator interface for controlling the VBX-160 system and the CNC. The VBXC has five primary screens: Home, Configuration, Settings, Calibration, and About. The operator works primarily with the Home Screen to enter and run jobs.
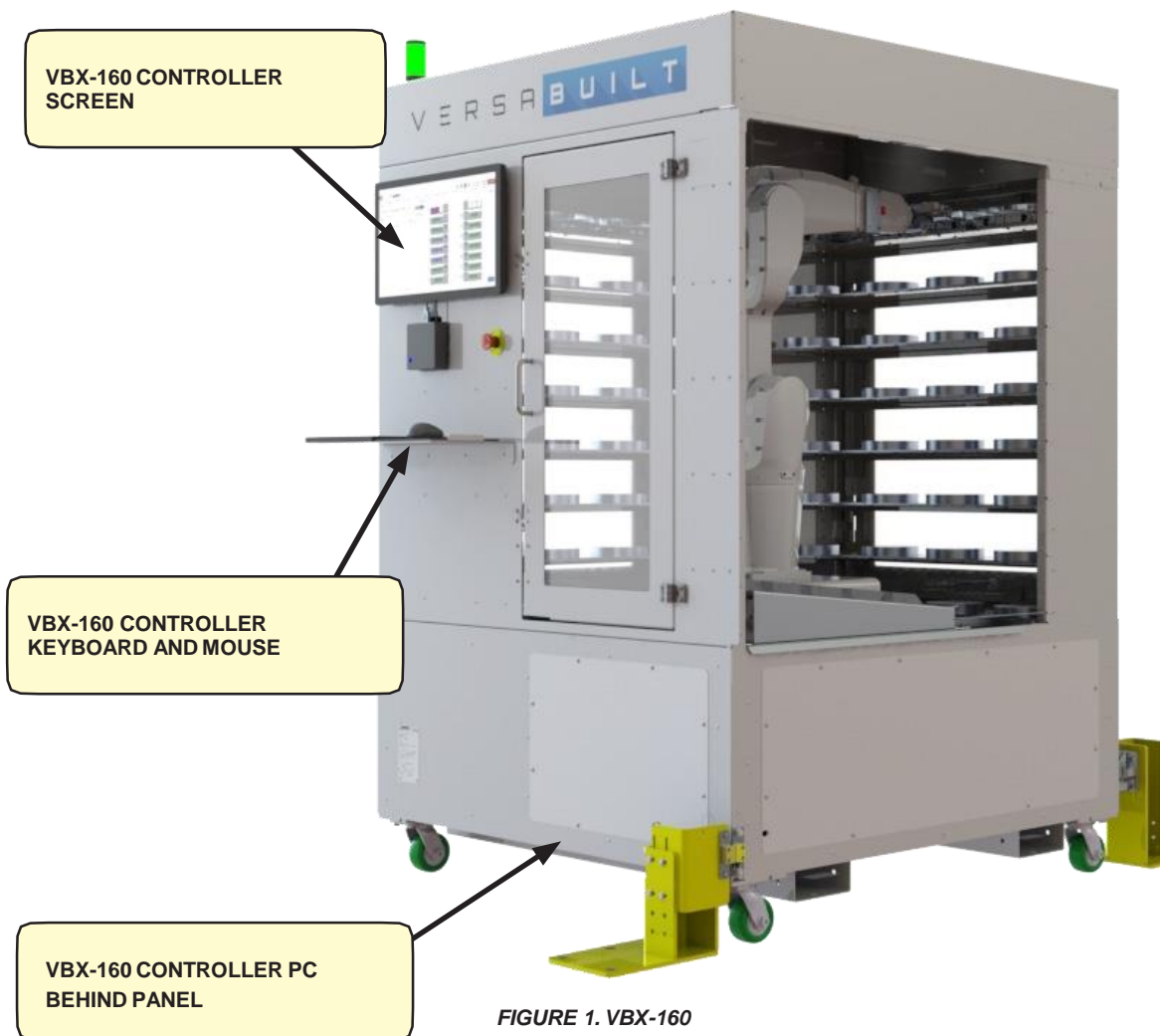
VBX-160 CONTROLLER SCREEN

VBX-160 CONTROLLER KEYBOARD AND MOUSE

VBX-160 CONTROLLER PC BEHIND PANEL

*FIGURE 1. VBX-160*

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## VBX-160 RUNNING A JOB

The VBXC is designed to make it easy for the operator to schedule new jobs for running. The VBXC part configuration file keeps track of each part's requirements for processing in the VBX-160 and allocates resources in the VBX-160 for the part's MultiGrip vise, jaws, and raw materials. The VBXC is capable of running multiple parts simultaneously and will automatically switch between jobs without operator intervention.

The VBXC keeps track of the following data for each part configured in the system:

1. MultiGrip Jaws used to process the part
2. Part configuration information includes but is not limited to:
   a. Raw material dimensions
   b. Number of operations to mill the part
   c. CNC programs used to mill the part
   d. Vise pressure used for milling
   e. Part options, including part wash and dry speed

| Note: | Part configuration data is created in the Configuration Screen of the VBXC. The part configuration process is described in the VBX-160 Configuration and Process Control Manual VBXC 3.2 (#D10088). |
|---|---|

The VBXC does not track all data or verify all parts in the system are configured correctly to successfully process a part in the VBX-160. The VBXC does not track CNC tool requirements for each part configuration. The operator must manage tool dependencies for each part and schedule jobs in the VBXC accordingly. The operator will need to verify and configure the following to successfully process each part in the system:

1. CNC cutting tools required for the part are installed, measured and have adequate tool life
2. CNC programs required to process the part are loaded into the CNC

Steps to take prior to processing parts with the VBX-160:

1. Read the VBX-160 Safety Manual (VersaBuilt Document #D10002)
2. Read the VBX-160 System and Maintenance Manual (VersaBuilt Document #D10013)
3. Verify that the wash bucket is filled properly with solution and is free of chips
4. Verify that the MultiGrip vise and MultiGrip Jaws are free of chips and do not show signs of wear
5. CNC door pathway is free of chip build up
6. Interior of CNC is free of excessive chips that could affect the milling or jaw to vise placement
7. Chip outfeed systems are enabled and have sufficient capacity to handle the parts to be milled
8. Make sure there is sufficient CNC consumables, such as coolant, to mill parts
9. VBX-160 is pivoted up to the CNC and the locking pin is in place
10. The VBX-160 and the CNC are powered on and ready to run
11. The VBX-160 has air supply and the air supply is in automatic mode
12. Be prepared with specific job information, including:
    a. Order ID
    b. Part Number
    c. Part Quantity

## Steps For Running A Job

The running of new jobs in the VBX-160 consists of the following steps:

1. Ensure the CNC is loaded with the necessary tools and programs to run the job

2. Manually machine jaws and parts prior to configuring your parts for the VBX-160.

3. It is critical for successful introduction of robot tending to first prove out good parts with manual loading. This step will help ensure you have a viable working CNC manual process and help successful introduction to automatic processing.

> Note: When manually machining parts Vise Pressure is changed via the Status Bar    ⬈ 5psi

4. Add the new job to the VBXC

5. Complete all required VBXC Actions on the Actions Panel

6. Click Cycle Start to begin running jobs

7. At regular intervals, as parts are completed or after the job has completed, unload completed parts and MultiGrip jaws when prompted by the VBXC in the Actions Panel

## CNC Communication

CNC Communication varies depending on the type of CNC being used. Some CNCs let the VBX-160 directly request which milling program to pull up on the screen and run, other CNCs must use the VersaBuilt Dispatcher as an added step.

### CNC Dispatch Protocol (CDP)

If the VersaBuilt Dispatcher is used for this CNC, the Dispatcher should be loaded and selected on the CNC controller screen. By default the Dispatcher is program number 9000. Verify the CNC is in memory and automatic modes.

### Generic CNC Driver/Dispatcher

If this integration of the VBXC is using Generic CNC Driver, the VBXC will not be able to automatically switch between different milling programs. A different CNC Dispatcher Program will need to be selected by an operator when changing parts.

| AIR PRESSURE | CLAMPING FORCE (LBF) |
|---|---|
| 10 | 344 |
| 20 | 689 |
| 30 | 1033 |
| 40 | 1378 |
| 50 | 1722 |
| 60 | 2067 |
| 70 | 2411 |
| 80 | 2756 |
| 90 | 3100 |
| 100 | 3444 |
| 125 | 4306 |
| 150 | 5167 |
| 175 | 6028 |
| 200 | 6889 |
| 225 | 7750 |

*TABLE 1. VISE PRESSURE TO CLAMPING FORCE VALUES*



*FIGURE 2. HAAS CNC RUNNING DISPATCHER*

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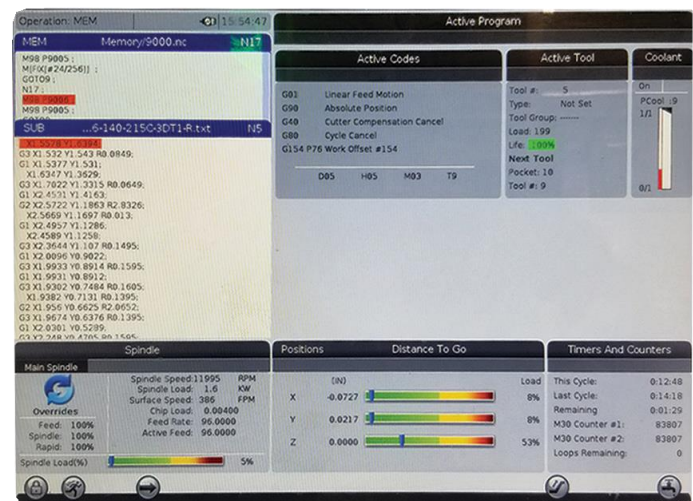D10087 Rev .02 AUGUST 2019

## VBXC HOME SCREEN

The primary screen used by the operator is the Home Screen. Using this screen, the operator manages jobs and controls processing with the VBX-160. The Home Screen is accessed via the screen selection menu. The Screen contains 5 panels: Actions, Jobs, Activity, Status and Cell.
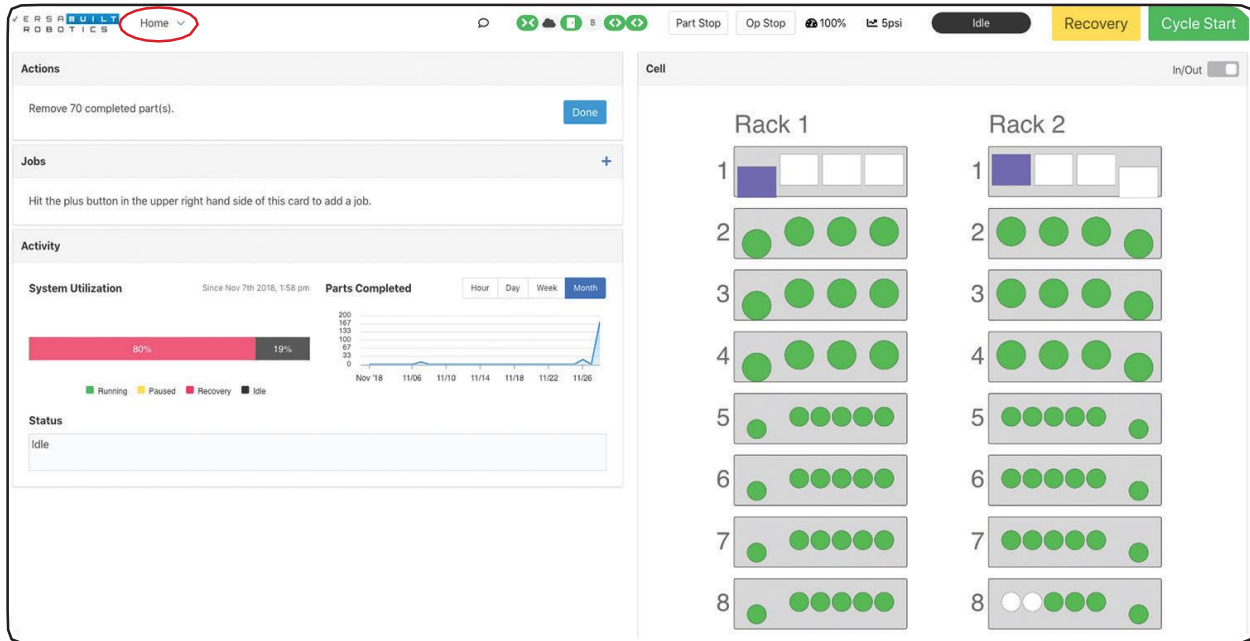


*FIGURE 3. HOME SCREEN*

### Status/Control Panel

The Status/Control Panel appears at the top of all VBXC screens. The buttons that appear may change based on the current state of the VBX-160. The figures below show an example of the Status/Control panel buttons in various states of processing.
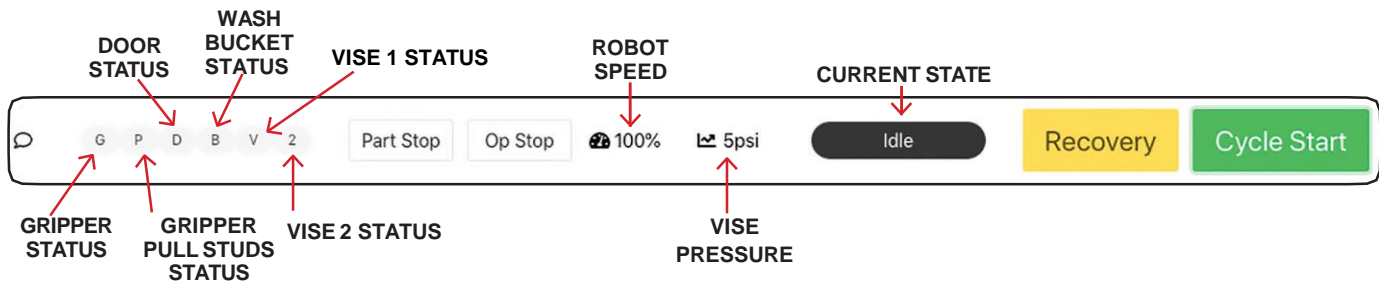


*FIGURE 4. STATUS/CONTROL PANEL*

The icons will change continuously while running a job. Figure 5 is an example of what the status icons look like when they are active: Gripper closed and gripper closed sensor detected. Gripper pull studs pulled and gripper pull studs pull sensor detected. CNC Door open and CNC door sensor detected. Wash Bucket idle. Vise 1 and Vise 2 open and open sensors detected.
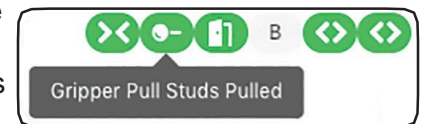


*FIGURE 5. ACTIVE ICONS*

Note: Refer to Quick Start Guide (Page 3) for a complete description of the Status/Control Panel buttons.

## Actions Panel
The Actions Panel displays any actions currently needed by an operator.

## Jobs Panel

### Add a New Job to The VBXC

The VBXC lists currently running jobs in the Jobs Panel. The operator can enter new jobs, cancel jobs and review current jobs in the Jobs Panel. Jobs are processed in the order that they are entered in the VBXC.



*FIGURE 6. ACTION PANEL*



*FIGURE 7. JOBS PANEL*

To add a new job click the "+" in the upper right hand corner of the Jobs panel.

The following information is entered or displayed in the add new Jobs panel:

- Job ID: an identifier for the job

- Part: Using the drop down, choose the preconfigured part of the part to be ran in this job.

- Count: enter the number of parts you want to process

- Pause after Completion: this feature is useful for First Article Inspection Testing



*FIGURE 8. ADD A NEW PANEL*

Note:    Additional jobs can be entered at this step or at any time, even if the VBXC is running a job. Actions needed to run the job will be displayed in the Actions Panel.

## Activity Panel
The Activity Panel shows simple metrics of the VBX-160. System Utilization shows how long the VBX-160 has been in each state (Running, Paused, Recovery, or Idle). Number of parts have run in the last Hour, Day, Week and Month are graphed to the right. Below System Utilization the Status panel shows the current status of the VBX-160.
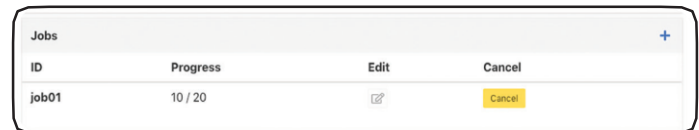


*FIGURE 9. ACTIVITY PANEL & STATUS*

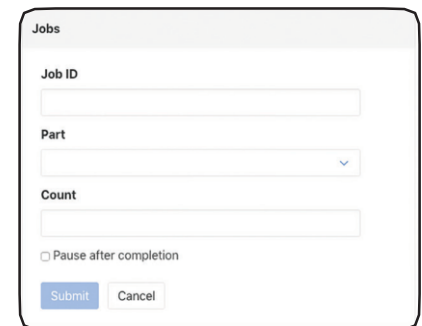Applies to machines built after Sept 2017

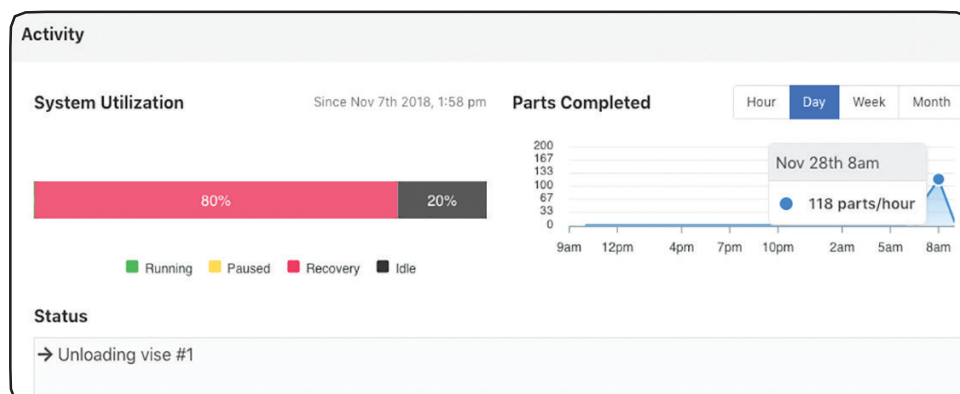## Cell Panel

The Cell Panel displays the current configuration of each shelf and each slot in each shelf in the VBX-160. The Cell Panel allows interaction with each slot to perform available actions and the view of the rack to be changed. Pressing the In/Out button changes the view of the racks. The **In** view shows shelves from the inside of the VBX-160 looking outwards. The **Out** view shows shelves from the outside of the VBX-160 inward.

The VBXC uses symbols and colors to show the status of each slot in the Cell Panel, including the current location of MultiGrip jaws and parts.
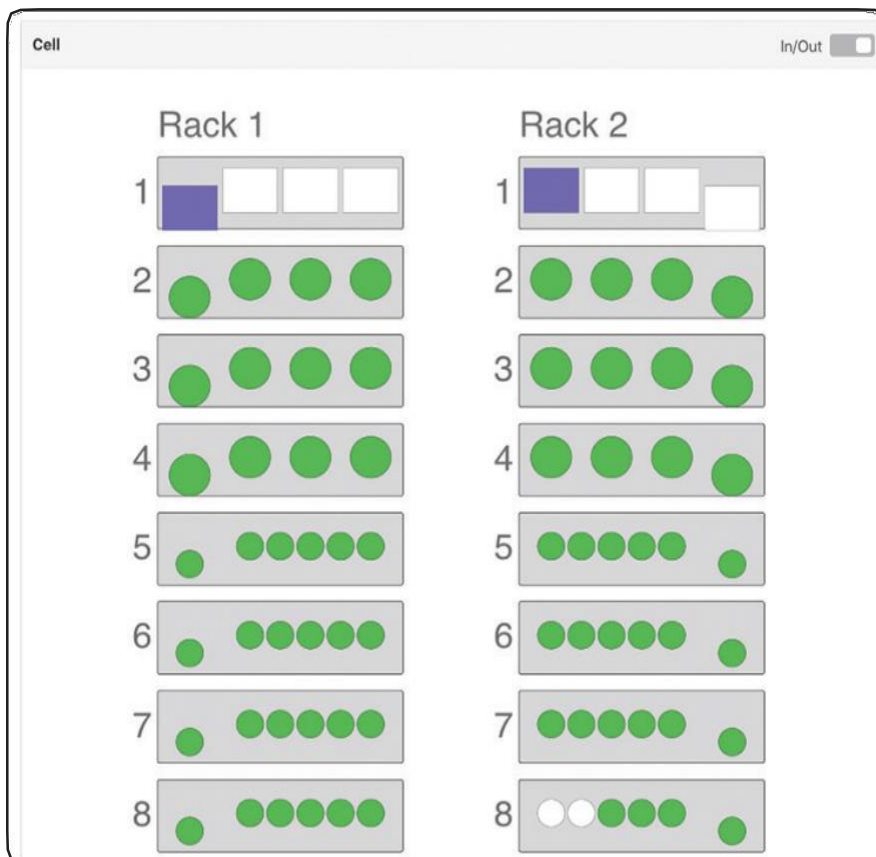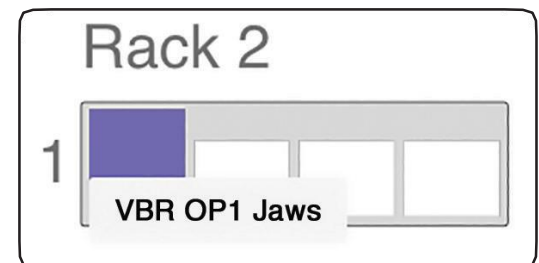


*FIGURE 11. LOADING JAWS*



*FIGURE 10. CELLS PANEL*
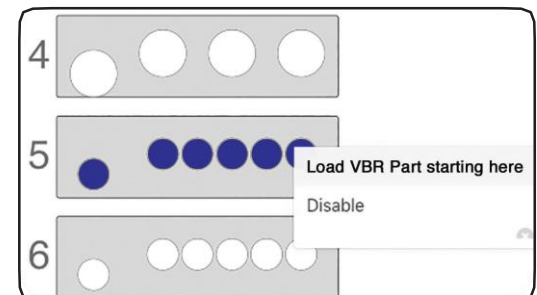


*FIGURE 12. DESIGNATE SLOT LOAD POINT*

| MultiGrip vise jaw slots: represented by rectangles on shelves 1 and 9 | Part slots: represented by circles on shelves 2-8 and 10-16 |
|---|---|
| • MultiGrip jaws on shelf: Indigo<br>• MultiGrip jaws in vise or gripper: Light Purple<br>• MultiGrip jaw slot is empty: White<br>• MultiGrip jaw transferring: Blue<br>• MultiGrip jaw error: Red<br>• MultiGrip jaw canceled: White<br>• Disabled Slot: Gray | • Part waiting in slot: Indigo<br>• Part on shelf ready to unload: Green<br>• Part slot is empty: White<br>• Part held by robot: Purple<br>• Shelf transfer: Purple<br>• Part error: Red<br>• Part canceled: White<br>• Disabled Slot: Gray |

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## Changes to the Cell Page - Shelf Configuration

To change the self configuration follow these steps:

1. Go to Configuration Page
2. Under Parts click on Edit Configurations
3. Select the number of parts you want to use per shelf.
4. Refer to Table 2 to ensure your Parts have enough clearance per shelf.

| PICKS PER SHELF | PART SPACING | MAX PART WIDTH/DIA. |
|---|---|---|
| 3 | 12.2125 | 10.5 |
| 4 | 9 | 8 |
| 5 | 6 | 5 |
| 6 | 4.5 | 3.5 |
| 8 | 3 | 2.5 |
| 18 | 2.5714 | 2 |

*TABLE 2. STANDARD LOCATOR OPTIONS*



*FIGURE 13. SHELF CONFIGURATION PANEL*



*FIGURE 14. SHELF TEMPLATE*

## Configuration Changes to Running Job

Changing the configuration of a running job requires job to be canceled and restarted. Only then will the job update with the new part configuration change. Current jobs will not update automatically.

## Required VBXC Actions

The actions, the operator must take, to begin run a job are listed in the Actions Panel once the job is added. All of the actions must be completed before pressing Cycle Start or an error will indicate to complete the required actions. The following actions may be required to begin a job:

### Load Jaws

The MultiGrip jaws required must be loaded into the VBX-160 on the top shelf. Click on the Jaw slot where the MultiGrip jaw will be loaded and select which MultiGrip jaw is in that location.

### Load Parts

Raw materials for the job must be loaded into the VBX-160. It is not necessary to load parts in sequence. Operators may designate any slot on a rack to start a job. Right click on a slot and select the part to load. It will automatically fill all slots that match the proper shelf template for that part.

**Press Cycle Start**

Before pressing the Cycle Start button, ensure that the CNC is ready to process all jobs loaded on the VBX-160 including:

1. Having the CNC programs in memory
2. Cutting tools required for the job are loaded in the CNC

Once the CNC is ready and raw material is loaded in the appropriate shelves on the VBX-160, press the Cycle Start key to begin running jobs and milling parts.

**Unload Completed Parts and MultiGrip Jaws**

As the VBX-160 completes parts, the VBXC will display in the Actions Panel a list of parts that can be removed from the VBX-160. When the operator removes those parts and acknowledges the Action by clicking the Done button, the VBXC can allocate more parts for processing to those slots. When a job is complete and there are no other jobs pending that use the MultiGrip jaws for the job, the VBXC will prompt the operator to remove the jaws.

**Important Notes:**

Actions that can be performed due to available resources will be listed in the Actions Panel.

For example: if a new job requires space in the racks for jaws or parts and that space is currently occupied by the resources of another job, those actions will not be shown in the Actions Panel until the resources become available. To make resources available, the operator must remove the parts or jaws from the VBX-160 when prompted and click the Done button.

The Racks panel must have at least one part shelf configured for the part's pick configuration. If a job is added to the VBXC and there are no shelves currently configured for that pick template, an error message will be displayed in the Actions Panel. To enable processing for the job, edit the Shelf Template configura- tion in the Configuration Page by selecting the template required for the part configuration for at least one shelf in the VBX-160.

**Canceling a Job**

Find the job in the Jobs Panel, then click the Cancel button next to the job description to cancel the job.



*FIGURE 15. CANCEL JOBS SCREEN*

| Note: | When a job is canceled while that job is running the VBXC enters Recovery mode. This enables the system to be restored to a normal state. If there are no parts or jaws currently held in a gripper or vise, then all that is needed is to send the robot home and then recovery can be exited. |
|---|---|
| | To pause the process after the part completes, click the Part Stop button to stop VBX-160 from continuing onto the next part. Click Cycle Start to resume processing. |

Refer to the Actions Panel for tasks associated with canceling a job. Tasks may include unloading parts or unloading jaws. Additional tasks may be Recovery related and involve actions such as removing items from the gripper and/or vise and moving the robot arm to Home. Refer to the Recovery section for information related to these types of tasks if the VBXC enters recovery mode after a job is canceled.

## RECOVERY

### Initiating Recovery

Recovery occurs when the robot stops in response to an error. An operator can also initiate Recovery by either clicking the Recovery button or canceling a job that is running. The Recovery button is visible on the Status/Control Panel when the system is in a Feed Hold state.

Once recovery is initiated, the actions for recovery are displayed in the Actions Panel. All recovery related actions must be completed before another job can be started. Initiating the recovery state clears the current processing state of the VBXC. The Recovery mode cancels all parts and MultiGrip jaws that are held by the robot or in the vises. Communication with the robot and CNC is reset.

### Robot Errors That Initiate Recovery

When the VBX-160 robot encounters an error, that it cannot recover from automatically, the VBXC will enter Recovery mode. Most robot errors that initiate Recovery mode are caused by the robot unexpectedly colliding with something. To prevent further errors, understanding the cause of the collision is important. Before executing the Recovery actions, investigate why the robot encountered the error and take the necessary steps to prevent future errors.

### The Recovery Panel

When Recovery is initiated, a Recovery Panel appears in the Home Screen. To send the Robot to CNC Home click Enable, wait for the system to enable, then click Home and the Robot will go to "CNC Home".
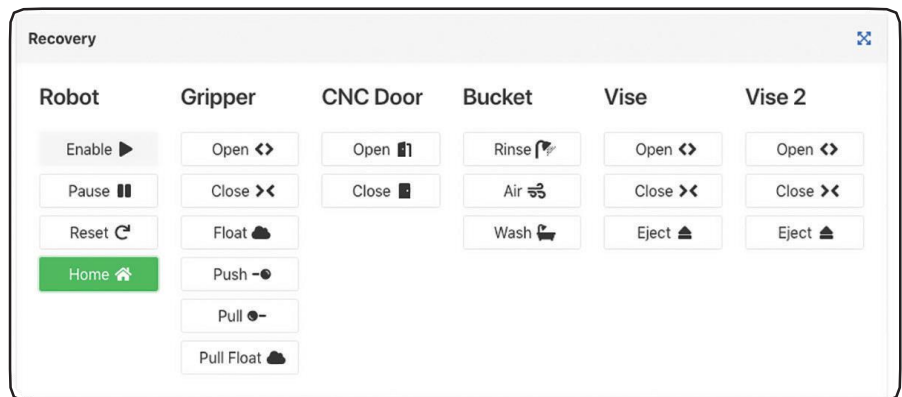


*FIGURE 16. RECOVERY PANEL*

### Operator Initiated Recovery

In some cases, it may be desirable to initiate Recovery. For instance if a part is damaged during CNC processing, the part will need to be canceled and the VBX-160 returned to a state where it can begin processing parts again. The Recovery screen can also be used to manually turn on the rinse pump making it easy for the operator to empty the rinse tank using the diverter valve.

To initiate Recovery, perform the following steps:

1. Press Feed Hold to stop the currently running job. (CNC will continue to mill)
2. Click the [Recovery] button to enter the recovery screen.
3. The VBXC will request confirmation to continue to Recovery. Click Yes. The system will now enter Recovery mode.

| Note: | The part that is currently processing is canceled when the system goes into the Recovery mode. After the Recovery mode is initiated by either the operator or the VBXC, the operator must complete the Recovery actions to exit Recovery before another job can be started. |
|---|---|

## Disengage Part with Robot and Exit Recovery Mode

1. Enable the robot by clicking on the [Enable] button. This allows robot to move.

> Note: Reduce robot speed to 10% when first learning how the robot moves.

2. Resolve and clear the listed errors, if any. Put away anything held in the gripper and/or vise.

3. Release Part by clicking an empty slot in the Cell Panel.

4. Fill in the information requested in the Place Part Screen.

> Note: 1. Entry Height and Place Height information is found in Part Configuration in the VBXC.
>
> 2. X-offset and Y-offset default is 0.

5. After the robot releases the part to the designated slot, click Done in the Actions Panel.

6. Disengage the robot with the gripper and/or vise.

## Manually Remove Parts from Gripper of Vise

Physically remove anything held by the gripper or vise by first using the gripper and vise controls to open, close or float the gripper or vise and then manually removing the items

## Disengage Jaws and Exit Recovery Mode

1. Enable the robot by clicking on the [Enable] button. This allows robot to move.

2. Release Jaws by clicking an empty slot on the Jaw Shelf in the Cell Panel.

3. Select OD or ID in the Place Jaws Screen.

4. Resolve and clear the listed errors, if any. In the Recovery Panel, send Home, click Done to exit Recovery.
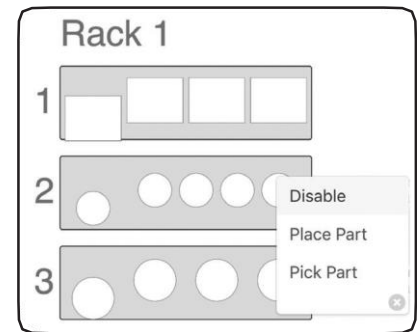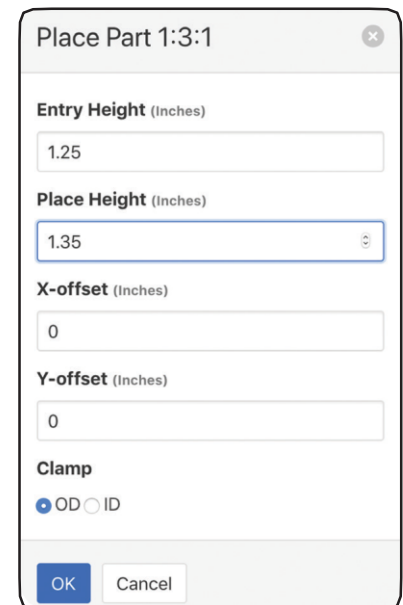

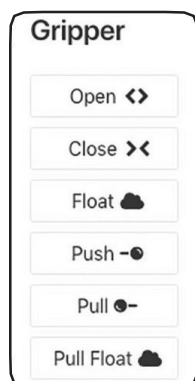*FIGURE 17. PLACE PART IN CELL PANEL*


*FIGURE 18. PLACE PART SCREEN*


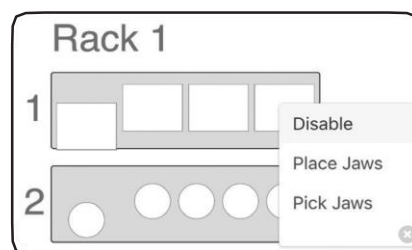*FIGURE 19. GRIPPER CONTROLS*


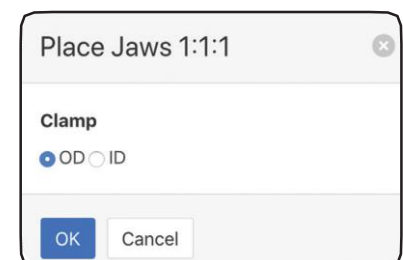*FIGURE 20. PLACE JAWS IN CELL PANEL*


*FIGURE 21. PLACE JAWS SCREEN*

## CONFIGURATION SCREEN

The Configuration Screen consists of four data panels: Jaw Definitions, Process Part Definitions, Shelf Configuration. Each data panel is independent of the other data panels. It is possible to be working in all three panels simultaneously. For example, editing a Jaw Definition while also editing a Part Definition.

The Status/Control Panel is displayed along the top of the Configuration screen and remains operable during configuration. This allows continued management and monitoring of jobs that are currently processing. Use the menu selection button to toggle between the Configuration screen and the Home screen if needed. Prior to leaving the Configuration screen, saving any completed entries by clicking on the save button ensures that information is saved. Detailed instructions, on how to configure Jaws and Parts, please refer to the VBX-160 Configuration and Process Control Manual VBXC 3.2 (VersaBuilt Document #D10088).



*FIGURE 22. CONFIGURATION SCREEN*

## *ABOUT SCREEN*

The about screen is where you would find:

- System Serial Number
- Resources
- Help Desk Ticket
- Software Version
- VBXC Logs
- Restart the VBXC



*FIGURE 23. ABOUT SCREEN*

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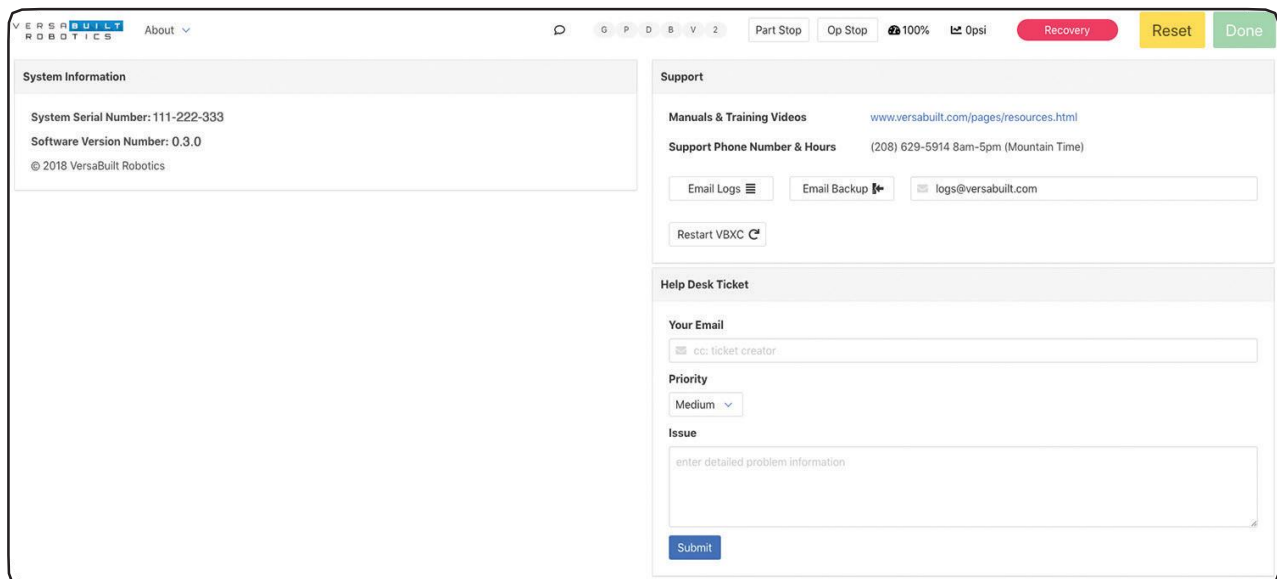
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## *GLOSSARY*

**Action List:** A list of actions for the operator to perform to address issues and keep the VBX-160 processing.

**Air/Electrical Panel:** Supplies air and power to the VBX-160 and the door vise control circuit.

**Air Knife:** blows air on the finished part to remove any remaining chips and drying off coolant.

**Brake Release:** A button on the back side of some robots. When this button is activated it releases or deactivates the brakes on each robot axis, causing the robot to move freely.

| Note: | Pressing this button will cause the robot to collapse under its own weight. The robot's weight and joints can pinch an operators limb causing serious injury. This button should only be pressed by qualified service personnel. |
|---|---|

**CNC Pneumatic Door Control:** Opens and closes CNC door to allow robot access.

**Configuration Screen:** This is where the system and parts are configured. Accessed via the screen selection menu.

**Cycle Start Button:** Visible when the system is in a Feed Hold state. It is used to start or continue processing.

**Dispatcher:** A VersaBuilt CNC program used to communicate between VBX-160 and some CNC machines.

**Door Open/Close Sensors:** Allow the VBX-160 to determine if the door is in the open or close position.

**Drip Tray:** A tray that is located in front of the robot to catch dripping coolant.

**Feed Hold Button:** Visible when the system is processing. It is used to immediately pause processing by the VBX-160. It will stop the CNC.

**Gate Post:** The post that locks the VBX-160 in position for processing.

**Grease Zerk:** Fitting for adding grease to the MultiGrip vise.

**Gripper:** The end effector on the robot arm that engages the MultiGrip jaws.

**Gripper Float Button:** If the robot is holding MultiGrip jaws, when this button is activated it will allow gripper to be actuated by hand.

**Gripper Interface:** The side of the MultiGrip jaws that the robot's MultiGripper interfaces to.

**Gripper Sensors:** Sensors on the gripper that help the robot identify if MultiGrip jaws are attached and if a part is being held.

**Intermediate Jaws:** Intermediate jaws are bolted to the vise and interface with MultiGrip jaws or pallets.

**IO Access Panel:** Located on the CNC side of the VBX-160, provides access to robot IO wiring panel for service.

**Job:** The processing of one or more pre-configured parts in the VBX-160.

**Jobs Screen:** The main screen on VBXC that allows operators to manage jobs and control the VBX-160. Accessed via the screen selection menu.

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**Machinable Face:** The top portion of the MultiGrip jaws or pallet that will be machined to hold a part.

**Manual Vise Valve:** A handle valve that allows the vise to be opened or closed manually.

> Note: Handle must be returned to center position to allow the robot to control the vise.

**Motors On Light:** A light on the upper robot arm and the robot controller. When this light is illuminated the robot motors are on and the robot can move at any time.

**MultiGrip Jaws:** Machinable jaws for holding a part. MultiGrip jaws come in two versions: outside diameter (OD) clamping and inside diameter (ID) clamping.

**MultiGrip Vise:** A vise with MultiGrip intermediate jaws for clamping MultiGrip jaws or pallets.

**MultiGrip Gripper:** The mechanism attached to the end of the robot's arm that interfaces with MultiGrip jaws.

**Operator:** A person trained to load, operate, and maintain CNC machines and VBX-160s.

**Pallet:** A one piece version of the MultiGrip jaw used for fixturing multiple parts or parts that cannot be reliably picked from the shelf. Requires the operator to secure the part to the pallet.

**Part Family:** A group of similar parts that can be processed with the same MultiGrip jaws, pallets and tooling.

**Part:** Generally referring to material to be processed.

**Part Locator:** A sheet with cutouts, attached to a shelf, to easily locate a specific part size and shape accurately on the shelf.

**Pivot Pin:** A pin that connects the VBX-160 to the pivot post.

**Pivot Post:** The hinge where the VBX-160 rotates from the CNC.

**Pivoted:** When the VBX-160 is pivoted away from the CNC to allow access to the CNC or robot.

**Power Cable:** A black cable that supplies power to the VBX-160.

**Pre-Op:** An operation to cut probing features for a subsequent operation, for example, a dovetail feature.

**Probing:** Using a spindle probe to measure the location of a part in the CNC or the size or shape of a machined feature of the part.

**Recovery Button:** This button is used by the operator to manually initiate Recovery mode to clear the current processing state of the controller, typically after an error has occurred.

**Rack System:** The racks contained in the VBX-160. The VBX-160 contains two racks with anywhere from 4 to 9 shelves on each rack depending on part size.

**Recovery Mode:** An operating mode of the VBXC designed to bring the system back to a starting state after an error occurs or when the operator wants to bring the system back to a starting state and is ready to continue processing.

**Rinse Bucket:** The wash bucket that contains an anti-bacterial solution and anti-rust solution a pump for rinsing the finished part.

**Robot Communication Cable:** A cable that allows the VBXC to communicate with the robot controller.

**VBXC Access Panel:** A removable panel on the operator side of the VBX-160 that provides access to the VBXC controller, electronics, power, and air connections.

**Safety Sensor:** The VBX-160 has 4 sensors, one on each door and one on the gate post. If any safety sensor on this safety circuit detects that a door is open or the VBX-160 is pivoted, the robot will immediately stop. The VBXC will enter a pause state and not be able to Cycle Start until the door is closed or the VBX-160 is pivoted.

**Safety Stop:** When a door is opened or if the robot has a hard collision, the robot will enter a safety stop state. In the safety stop state, the robot is unable to move and the motors on light will be off. The safety stop state will need to be cleared by the operator to continue processing. Safety Stop will send the VBXC into Recovery Mode.

**Screen Selection Menu:** Located in the upper left hand corner of all screens. The menu has a drop down list to select one of the following screens: jobs, configuration.

**Shelf:** Each shelf can hold parts or jaws. Jaws can only be placed on the top shelf of each rack. Shelves are part of a rack in the VBX-160.

**Shelf Slot:** The location on a shelf where the robot will pick a part or pallet.

**Shelf Template:** A sheet engraved with graduated markings to show where to center the material to be processed for robot picking.

**Signal Cable:** A cable that connects low voltage signals between VBX-160 and air/electrical panel.

**Vise Sensors:** Used to determine if the vise is holding a part.

**VBX-160 :** The enclosure of the robot and all of its components.

**VBX Controller:** Also known as the VBXC, the operator interface for controlling the CNC.